

EXHIBIT 17

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An (Even More) Inconvenient Truth: Why Carbon Credits For Forest Preservation May Be Worse Than Nothing

Lisa Song

RIO BRANCO, Brazil — The state of Acre, on the western edge of Brazil, is so remote, there's a national joke that it doesn't exist. But for geochemist Foster Brown, it's the center of the universe, a place that could help save the world.

"This is an example of hope," he said, as we stood behind his office at the Federal University of Acre, a tropical campus carved into the Amazon rainforest. Brown placed his hand on a spindly trunk, ordering me to follow his lead. "There is a flow of water going up that stem, and there is a flow of sap coming down, and when it comes down it has carbon compounds," he said. "Do you feel that?"

I couldn't feel a thing. But that invisible process holds the key to a massive flow of cash into Brazil and an equally pivotal opportunity for countries trying to head off climate change without throwing their economies into turmoil. If the carbon in these trees could be quantified, then Acre could sell credits to polluters emitting clouds of CO₂. Whatever they release theoretically would be offset, or canceled out, by the rainforest.

Five thousand miles away in California, politicians, scientists, oil tycoons and tree huggers are bursting with excitement over the idea. The state is the second-largest carbon polluter in America, and its oil and gas industry emits about 50 million metric tons of CO₂ a year. What if Chevron or Shell or Phillips 66 could offset some of their damage by paying Brazil not to cut down trees?

The appetite is global. For the airline industry and industrialized nations in the Paris climate accord, offsets could be a cheap alternative to actually reducing fossil fuel use.

But the desperate hunger for these carbon credit plans appears to have blinded many of their advocates to the mounting pile of evidence that they haven't — and won't — deliver the climate benefit they promise.

I looked at projects going back two decades and spanning the globe and pulled together findings from academic researchers in far-flung forest villages, studies published in obscure journals, foreign government reports and dense technical documents. I enlisted a satellite imagery analysis firm to see how much of the forest remained in a preservation project that started selling credits in 2013. Four years later, only half the project areas were forested.

In case after case, I found that carbon credits hadn't offset the amount of pollution they were supposed to, or they had brought gains that were quickly reversed or that couldn't be accurately measured to begin with. Ultimately, the polluters got a guilt-

free pass to keep emitting CO₂, but the forest preservation that was supposed to balance the ledger either never came or didn't last.

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Highway BR-364 in the city of Rio Branco, with a logging company on one side and a lake on the other.

“Offsets themselves are doing damage,” said Larry Lohmann, who has spent 20 years studying carbon credits. While we're sitting here counting carbon and moving it around, more CO₂ keeps accumulating in the atmosphere, he said.

It's “the worst possible idea — except for everything else,” said Timothy Searchinger, a Princeton researcher who studies land use and climate change. “If we had enough money, it could probably help a lot.”

He echoed an idea I heard again and again from proponents of this concept: Even hundreds of attempts across the world had not given forest preservation offsets a meaningful chance to work. Many projects sold credits on a voluntary market, to corporations seeking green public relations or well-meaning consumers. That didn't allow them to generate enough money to succeed. If California and other giants joined the market, that could finally inject real resources into the effort.

California's cap-and-trade program allows companies to offset a small percentage of their carbon output with forest preservation projects in North America. But this year, the state's Air Resources Board could approve its proposed Tropical Forest Standard — a blueprint for how carbon offsets could be awarded for intercontinental programs. Experts say the standard could and likely will be adopted by other countries.

Everyone is looking to Acre as the prime testing ground. “Acre's program is the most advanced,” a board spokesman said in an email. Supporters kept sending me brochures that used words like “pioneer,” “innovative” and “new business models” and showed smiling residents harvesting Brazil nuts instead of cutting down the rainforest.

So I traveled to Acre to see how its program was working. I found swaths of cow pasture where locals once tapped rubber from trees; there's no way to make a living from sustainable alternatives, they told me, so the trees have to go. Government workers spoke of conservation, but political leaders have cut funding for it and plan to expand agribusiness. Several Acre officials readily acknowledged that their priority is getting foreign aid to protect forests; the validity of the offsets is an afterthought.

Those eager to see the Acre program succeed told me it was OK if the offsets didn't really cancel out all of the carbon emissions they were supposed to, as long as some trees were saved and smaller gains were made.

“Perfection can be the enemy of delivery,” Brown said. “There are a whole bunch of problems with it. ... What is the alternative?”



Cattle farms on Highway BR-317, between the cities of Rio Branco and Xapuri. Foster Brown, a geochemist at the Federal University of Acre, in a regrown patch of rainforest near his office.

A History of Failure

If the world were graded on the historic reliability of carbon offsets, the result would be a solid F.

The largest program, the Clean Development Mechanism, came out of the 1997 Kyoto Protocol, when dozens of nations made a pact to cut greenhouse gases. European leaders wanted to force industry to emit less. Americans wanted flexibility. Developing nations like Brazil wanted money to deal with climate change. One approach they could agree to was carbon offsets.

The idea worked marvelously on paper. If a power plant in Canada needed to shave 10% off of its emissions but didn't want to pay for technology upgrades, it could buy offsets from projects in the developing world. Investors planning to build a coal plant in India could instead decide to build a solar plant, using the money from the anticipated sale of carbon credits to cover the higher costs of developing solar power. The gap in emissions between the hypothetical coal plant and the actual solar farm would be converted to offsets. (Each credit is equal to the global warming caused by a metric ton of CO₂.)

The program subsidized thousands of projects, including hydropower, wind and, infamously, [coal plants that claimed credits](#) for being [more efficient](#) than they would have been. CDM became mired [in technical](#) and [human rights](#) scandals, and the European Union stopped accepting most credits. [A 2016 report](#) found that 85% of offsets had a “low likelihood” of creating real impacts.

Another global program, Joint Implementation, has a similar track record. A [2015 paper](#) found that 75% of the credits issued were unlikely to represent real reductions, and that if countries had cut pollution on-site instead of relying on offsets, global CO₂ emissions would have been 600 million tons lower.

■ A deforested area on the road to the Chico Mendes Extractive Reserve.

Almost all of the projects failed to meet a standard required for any true carbon offset called additionality. What it means is that the environmental gains are only real if the solar farms or windmills would never have been built without the credits.

The programs largely avoided credits for forest preservation, in which a polluter pays a landowner to reduce deforestation. The science was [too complicated](#). How are we to know which trees were saved because of such projects, and which would have survived without them?

The uncertainty didn't stop delegates at the United Nations from entertaining the idea during climate talks starting in 2007.

The UN formalized the concept as REDD, or Reducing Emissions From Deforestation and Forest Degradation. Proponents expected the carbon incentives would create billions of dollars to transform conservation as countries or corporations used it to meet mandated climate goals. But the world didn't get a deal strong enough to create demand, so the anticipated funding never emerged.

Instead, the UN supported pilot programs, as did the World Bank and the U.S. Agency for International Development. Nongovernmental organizations and private

companies funded hundreds of small-scale offset projects, and a few countries launched “results-based” programs, which reward preservation without generating offsets.

There is no central authority to deal with the varieties of REDD that now exist. No one has done a comprehensive assessment of how effective these programs actually are.

■ Mining activity along Highway BR-364, with Jamari National Forest in the background.

I found a few that came close. In 2015, a French research center [examined 120 projects](#) and found that 37% overlapped with existing protected lands like national parks. Though offsets require an added benefit, the authors concluded REDD was simply layered onto existing conservation plans, reducing it to a “logo to attract financing.”

Then, there are the findings out of Norway, a major exporter of oil and natural gas and the world’s largest supporter of REDD, representing about half of all funding.

Tucked into a little-noticed report [published last year](#) by Norway’s Office of the Auditor General was the revelation that the country’s efforts had failed virtually every test:

Despite a decade’s work and \$3 billion, results were “delayed and uncertain,” the science of measuring carbon was only “partially in place” and there was “considerable” risk of what’s called “[leakage](#)” — when protecting one patch of land leads to deforestation [somewhere else](#). That problem alone creates “considerable uncertainty over the climatic impact,” the report concluded.

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The Carbon Credit Card

I landed in Acre at midnight on March 11, and even then, the humidity felt unbelievable. The Amazon rainforest spans the entire state, an area slightly larger than Illinois with a population more the size of North Dakota’s. My first morning there, I met Brown at Capybara Kiosk, a gazebo on campus next to a lake where the world’s largest rodents munch on grass. The geochemist drove me to his office, which required a short journey through the Amazon’s famed red mud that could best be described as whitewater rafting in a pickup truck. The dirt roads are so precarious, Brown keeps a tow rope handy; I watched him use it later that day to help another driver.

It was a fitting metaphor for what I knew coming into Acre: Trying to preserve trees in any developing country is a slog, a tumultuous push against political volatility, lacking infrastructure and poverty, which drives people to violate whatever protections are in place to plant crops or mine for gold or just have enough lumber to build their homes.

Layer on top of that the most pressing requirement of making carbon offsets work, and the challenge can seem insurmountable.



A capybara at the Federal University of Acre. Brown helps tow a car stuck in the mud near his office.

When trees take in CO₂, the gas doesn't magically disappear: The trees simply store the carbon, incorporating it into their living tissue as they grow. When trees are destroyed, the accumulated carbon goes back into the atmosphere as CO₂.

Think of trees as "hiding the carbon for awhile," said Abigail Swann, an ecology professor at the University of Washington. Carbon dioxide lingers in the atmosphere for about 100 years. So forest offsets only work if the trees remain intact for a century.

In that sense, offsets are like the world's most forgiving credit card: The buyer gets all the benefit upfront, while it takes a century for the full debt to be repaid.

Proponents told me that even a half-century or a few decades could make a big difference. To them, forest offsets are about buying time for society to figure out how to power the world without fossil fuels.

But I'd read about projects that sold credits, only to have trees cut down soon after.



When a tree is destroyed, all the carbon accumulated over its lifetime is released back into the atmosphere.

In 2014, FIFA bought a batch of credits to help fulfill a sustainability pledge it made before the World Cup in Brazil. The offsets came from a project launched in 2009, after Almir Narayamoga Suruí, a leader among the Paiter-Suruí tribe in the Brazilian state of Rondônia, struck up conversations with Google and carbon market consultants.

The project aimed to cut deforestation in highly logged areas along the territory's borders, and it received funding from USAID. But some members of the tribe, disillusioned by the amount of money going to international groups for logistics management, [colluded](#) with loggers and anti-REDD activists to sabotage the project.

The project sold 250,000 credits as the tribal leader documented destruction. "Every day, 300 trucks leave our territory filled with wood," he [wrote in a public letter](#) in 2016. The project was suspended last year, after the loggers destroyed more trees than all the credits sold.



Partly deforested land in the territory of the Paiter-Suruí, where a REDD project was recently suspended. Almir Suruí, a leader of the tribe, examines a native cacao plant in a nursery.

Then, there was the project launched in 2008 to help Cambodian monks protect the forest where they lived. The project attracted powerful allies, including funding from the Clinton Foundation and support from the Cambodian government.

Meanwhile, the [forest was being overrun](#) — [by violent border disputes](#) between the Cambodian and Thai militaries, by logging sanctioned by the same government that supported the project, and by an influx of refugees and former Khmer Rouge soldiers who settled in the forest to farm. The project's hurdles should have been obvious; the

area was riddled with land mines.

The project was designed to protect 13 forested sites covering a total of 246 square miles. It's sold 48,000 credits and remains on the market, even though military bases and villages were built within the protected areas, [according to](#) Timothy Frewer, an Australian researcher who spent months on the ground. After an environmental group cited Frewer's findings in a 2017 report, the airline Virgin Atlantic [said it would stop](#) buying offsets from the project.

ProPublica enlisted Descartes Labs, a satellite imagery analysis firm, to review radar data for the 13 sites to determine how much forest remained. Project documents said these areas were 88% covered in forest, on average, in 2008. Our commissioned analysis found that as of 2017, they were only 46% forest. One of the protected areas, Angdoun Bor, started out as 90% forest; it is now 0%.

ProPublica contacted Verra, a nonprofit that set the quality assurance standards for the credits generated. A spokeswoman said the organization couldn't comment until it had done its own research. The consultants who are supposed to provide regular on-the-ground updates to Verra haven't issued a report in more than five years. Verra said the credits sold have already been used to offset pollution.

Leslie Durschinger, CEO of project developer Terra Global Capital, said in an email that the lack of carbon market buyers and donors have left the project "without the financial support it needs to succeed."

How Much Forest Is Left in Five Protected Areas in Cambodia

On average, the 13 protected sites in this REDD project in Cambodia were 46% forest as of 2017, according to an analysis of radar data done for ProPublica by Descartes Labs. These five show a range of outcomes within the project. While some areas, like Phaav, gained forest, most lost a significant number of trees, and one lost all of its forest.

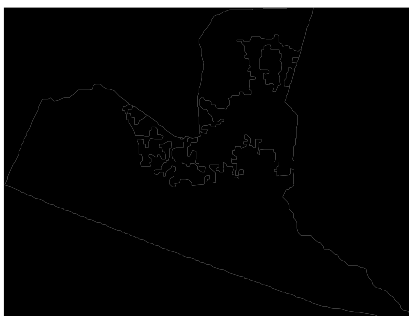




Sorng Roka Vorn
2008: 86% forest, 2017: 63% forest

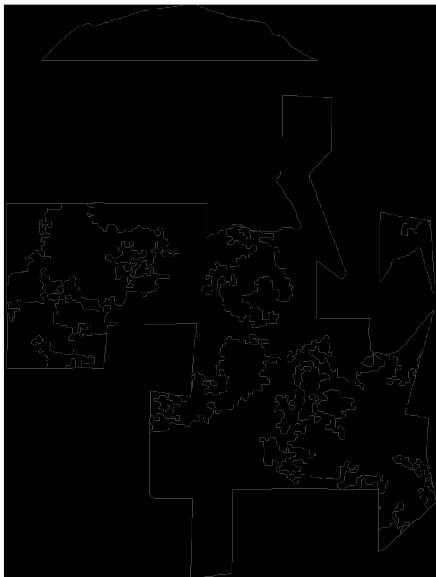


Phaav (Thmorda O Toekkhiev)
2008: 97%, 2017: 99%



O Sophy Kiri Prey Sruong
2008: 90%, 2017: 18%





Ratanak Rukha
2008: 86%, 2017: 33%





Angdoung Bor
2008: 90%, 2017: 0%

Thailand

Cambodia

Laos

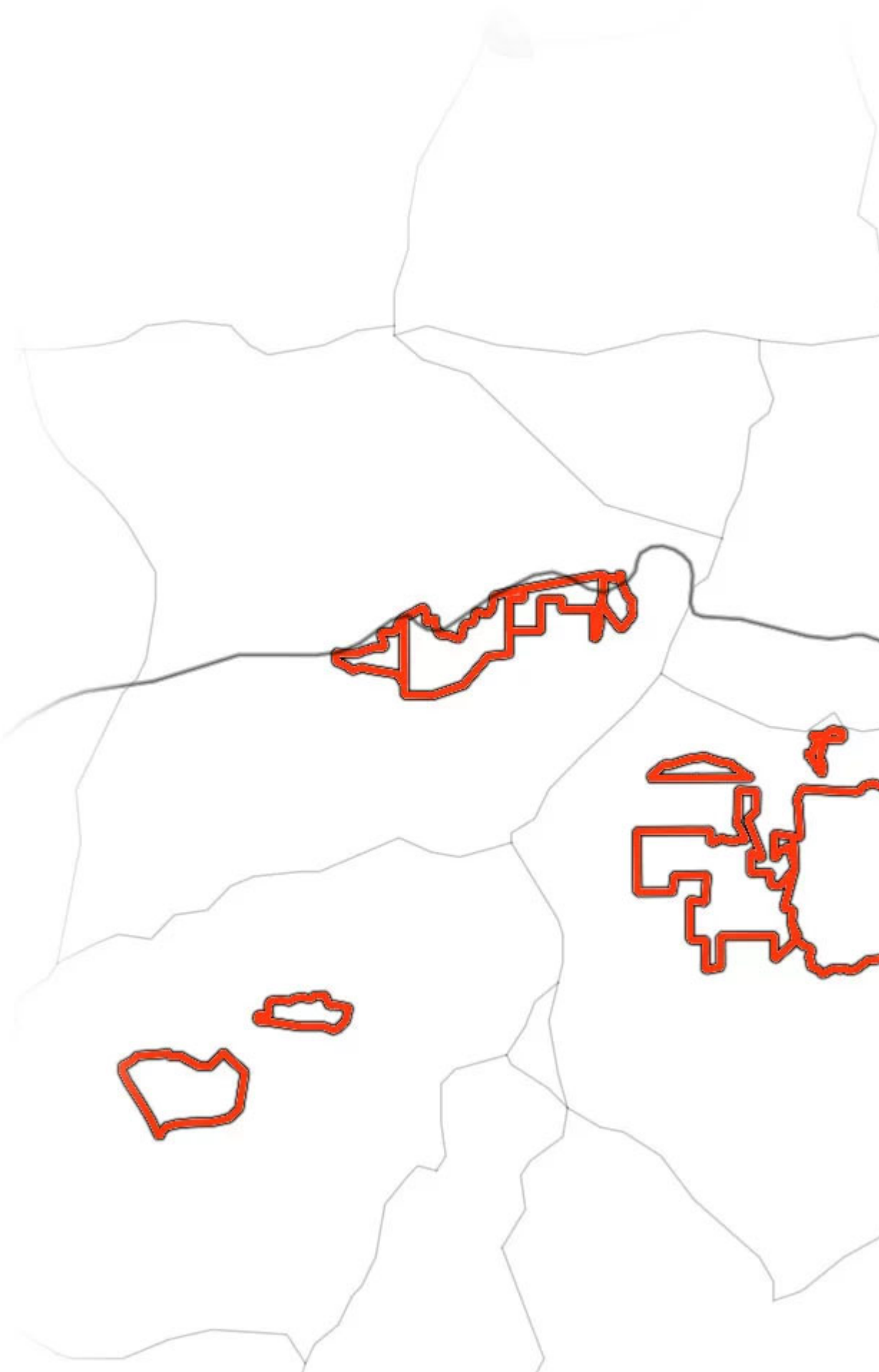
Vietnam

Cambodia

Thailand

REDD Project Boundaries

20 Miles



Al Shaw and Lisa Song/ProPublica; Source: JAXA PALSAR via Descartes Labs, USGS/NASA Landsat

Brown moved to Acre 26 years ago as a visiting professor and never left. He said the Amazon makes him feel “useful.” He tracks the impact of droughts and wildfires, estimates the carbon contained in the forest and has represented the Acre government in international climate talks. Everyone knows him here. He bikes around campus in a fluorescent reflective vest and tries to reach people however he can, including climate change workshops with rural workers and a regular column for the local paper; he wrote one about why he became a vegetarian (to save trees, of course).

He argues that concerns about the science behind initiatives like REDD are outweighed by the catastrophic potential of not moving to block deforestation.

“Trying to guarantee something for 100 years is impossible at this moment,” he told me. “If we don’t move quickly, now, this [science] discussion will tend to be theoretical.”

The scientists and forest experts I spoke with put it this way: If the Amazon loses enough trees, it will reach a tipping point, transforming from lush ecosystem into a semiarid savanna. The implications would be global. And rich nations aren’t generous enough to fund the preservation of tropical forests without getting something in return.

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Doing The Math

Everyone agrees forests are a vital buffer against climate change. The question is whether their preservation should be linked to offsets that allow others to keep polluting. For this to work, ecologists told me “rock solid” accounting is necessary.

The math starts with an [estimated](#) baseline, a guess at what deforestation would look like without offsets. The more deforestation you anticipate, the more credits you generate, the more money you stand to make. It’s easy to game the system by nudging the numbers toward the bleakest alternative reality.

French researchers raised questions about [two sites in Africa](#), which calculated their baselines using other, supposedly comparable areas. In Congo, the chosen reference area had many more roads and was next to shipping ports, so the logging potential was higher than in the project area. In Madagascar, deforestation in the reference area was already twice as high as in the project forest, so the project could claim to cut deforestation in half without doing a thing.

Brazil, which has a third of the world’s rainforests, has received more REDD funding than any other nation, and it’s used different baselines to justify vastly different results.


For the Amazon Fund, a Norwegian-supported program that doesn’t create offsets, Brazil claimed credit for 4 billion tons of avoided CO₂ over a decade starting in 2006 and [said its progress was worth](#) \$22 billion. Brazil came up with a higher estimate for separate funding from the United Nations: \$36 billion, by relying more on older

deforestation numbers that added an extra 3 billion tons of avoided CO₂ to its tab. Since Norway and the UN have limited budgets, Brazil has gotten less than \$2 billion.

Deforestation in Brazil is actually up; it was rising even under a forest-friendly government and reached a [decade high last year](#). Then, last fall, the country elected far-right president Jair Bolsonaro, who declared support for agribusiness over what he called fanatical environmental activism. He dismantled two climate change divisions and cut 24% of the budget for the country's top environmental enforcement agency.

Acre's new state government is aligned with him and says it wants to increase soy and cattle production. "Acre's economic salvation is agribusiness," [Gov. Gladson Cameli declared](#) during a meeting with the governor of Rondônia, one of the most heavily deforested states in the Amazon.

Keeping track of trees is essential. For the REDD programs, Brazil has relied on a satellite program that tracks large-scale tree loss, starting at chunks the size of about 10 city blocks. But there's emerging evidence that landowners are [clear-cutting smaller](#) areas to escape detection. It doesn't account for degradation, the thinning of trees from wildfires and logging; a major study found this cut the Amazon's carbon content by [an average of 55%](#). Luiz Aragão, who heads the remote sensing division at Brazil's National Institute for Space Research, said wildfires alone can change the numbers by 30%, and scientists are just [beginning to understand](#) how they create lasting damage.

 Forests can lose carbon through clearcutting, wildfires or selective logging.

I spoke to government workers in Acre about how they could guarantee that their credits were scientifically valid.

Vera Reis, executive director of Acre's state environmental agency (and Brown's wife), said the credibility is "paramount." Brazil's satellite programs can detect smaller areas of deforestation, she said; the lower resolution is used for bureaucratic purposes, to keep data consistent with historical records. Brazil uses much more detailed data for [federal climate change reports](#).

She said it's too early to tell what kind of data Acre will use if it links with California. The details will be ironed out, she said, and we "want confidence" in the numbers.

In the same meeting, Acre's politically appointed secretary of the environment, Israel Milani, steered the conversation to agribusiness opportunities that wouldn't damage the environment. "We are a relatively poor state," he said. "Everyone who lives in the forest, who lives from the forest, needs a livelihood."

Later, I met with Fluvio Mascarenhas, an analyst at a Brazilian federal agency that oversees the Chico Mendes Extractive Reserve, a conservation area with more than 11,000 residents. He warned against looking too closely at the quality of the credits being sold. "You are going to create a non-incentive to preserve," he said.

Like Brown, Mascarenhas will take any help he can get to save trees. His team has dwindled by half in the past decade, leaving 15 staffers to oversee 11 protected areas in Acre that cover up to 12,000 square miles — in addition to handling basic

government functions on the reserve, including education, public health and infrastructure.

From his office in the state capital of Rio Branco, Mascarenhas tracks cleared land through Google Earth. He showed me how he uses a yellow pushpin icon to tag landowners who've cut more than they're allowed to; the map was covered with yellow, far more offenders than they can reasonably process.



Fluvio Mascarenhas, environmental analyst at a federal agency that oversees the Chico Mendes Extractive Reserve. Residents on a motorcycle within the reserve.

To collect fines, there's no mail service, no credit card invoice. Mascarenhas' team spends weeks trekking through the forest, sleeping in hammocks and confronting loggers in person. Some can pay the fine, which amounts to about \$2,400. Many are too poor.

Mascarenhas told me about an attempt to create a cacao industry in the reserve so that locals could live sustainably. His agency spent two years researching how to do it. But they didn't get the funding for the second half of the project, to create a market. Those who cultivated the beans have nowhere to sell them, he said. "The animals are the only ones eating the cacao." They're applying for additional funding to implement it.

The government is trying to get people to value forest products like Brazil nuts and rubber, but the market isn't following. "The world is telling us we have to conserve," he said, "but nobody's showing us how."

A few weeks after I visited, the [president of Mascarenhas' agency resigned](#). It happened after Bolsonaro's federal environment minister threatened to investigate employees who didn't attend an agribusiness conference, in which farmers fought to strip protections from land important to wildlife. Three additional directors at his agency resigned, and the government replaced them with members of the military.



Samples of the types of timber found in Acre.

Unsustainable

The day after meeting with Acre officials, I woke up early to start the drive to the Chico Mendes reserve, a few hours outside Rio Branco. It is a place of legend in Acre, central to its reputation far outside of Brazil.

Chico Mendes was one of the first activists to get global attention for defending the Amazon when deforestation threatened the livelihood of residents who tapped rubber from trees. In the 1980s, he organized nonviolent protests that involved confrontations with logging trucks. He was gunned down in 1988, but his legacy lives on in conservation areas that cover 18% of Brazil. One of them, the reserve named after him in Acre, is home to the descendants of rubber tappers who protested alongside him.

I expected to see rainforest. But on the way there, all I saw were cow pastures. They

usually had a few trees — Brazil nut, which are a protected species, and palm trees, which are hard to cut with chainsaw blades.

Dercy Teles, a former president of the rubber tappers' union, lives just outside the reserve. She told me she had defended the forest with Chico Mendes because her livelihood depended on it; now, only those deep in the conservation area, without access to markets, roads or better options, still tapped trees. Corporations and developed nations created most of the damage leading to climate change, she said, yet “people want us to starve to reduce carbon emissions.”



An ox used for farm work on the land of Dercy Teles, a former union leader. Aerial view of Teles' house. Teles closing a gate near her house.

In 2010, while Acre was run by a progressive party that dubbed itself the “government of the forest,” the state launched a set of sustainability policies, to steer residents toward activities like harvesting Brazil nuts and digging fish ponds, which do not require cutting down trees. The initiative gained Acre funding from Germany, which has given \$33 million so far for deforestation cuts. It is a results-based program that isn't claiming to offset German pollution.

Brazil takes great pride in [a sharp drop](#) in Amazon deforestation since 2004. But it's impossible to tell how much of an additional benefit its funders have created. The drop coincided with a massive federal conservation program. Once the country loosened restrictions and enforcement in 2012, deforestation began to increase. Recent [research](#) on Norway's contributions to the Amazon Fund noted that “a causal link to decreasing Brazilian deforestation rates is yet to be proven with analytical rigour.”

Officials said the Acre program has benefited 7,000 indigenous people and about 14,000 other families, and they're working on a report with more detailed results.

The 2.3 million acres of the Chico Mendes reserve have retained 94% of their forest cover, but even so, deforestation rose 60% between 2000 to 2016, according to Mascarenhas' research. In and around the reserve, I saw evidence of the program at work — an ecolodge for tourists, a warehouse piled with Brazil nuts. But it wasn't hard to find people frustrated with Acre's sustainability programs.

Teles took me to visit her brother Pedro Teles de Carvalho, a former rubber tapper who became a teacher. The state sent him hundreds of saplings to plant fruit trees, he said, but didn't provide machinery to prepare the land — a necessity for farming the poor Amazon soil. The saplings sat untouched in his yard, still wrapped in plastic.



Pedro Teles de Carvalho holds seedlings he received from the government. Left: A rubber tree plantation in the Chico Mendes reserve. Top: A swan boat at an ecolodge within the reserve. The lodge was closed for the rainy season.

Next, I met Carvalho's neighbor, Francisco Maurício Rios, a retiree who gets by on a small pension. Thinking he might be able to buy a motorcycle, he tried to participate in a sustainable logging program. It didn't earn him enough for an electric bike. He

said the government also paid to dig two fish ponds. One dries up every summer; the other provides enough fish to eat, but not to sell. The government also sent rubber-tapping trees. He said he can't afford fertilizer to help them grow.

These kinds of frustrations have undone forest offset projects across the world. They target rural residents who would otherwise cut down trees for fuel or to clear pastures for agriculture, but that only works if carbon sales provide a reliable alternative. They rarely do. Rubber from the reserve sells for about 2 reais per kilogram, barely enough for a cup of coffee, while a single cow is worth 800 reais, about \$200.

José Romário Gomes da Silva and Elizete Carneiro de Brito live with their 5-year-old daughter, Thaíssa, in a home filled with things their parents never had: a cellphone, a sofa, a pink shag rug. In part, that's because of the small herd of cows they keep on land in the reserve that used to be covered with trees.

"Cattle is a secure market. You can get a good income selling a calf, an ox," Silva said.

"Who is willing to rubber tap nowadays?" Brito said. "Nobody, practically nobody. We want an easier way to live."



Crossing a river on the way from Xapuri to the Chico Mendes reserve. A close-up of a log near Francisco Maurício Rios' home. Rios stands by a pile of logged trees next to his house. José Romário Gomes da Silva and Elizete Carneiro de Brito, with their daughter Thaíssa.

'Ok, Smartass, What's Your Solution?'

My visit to Acre suggested that even the best REDD program in the world was running into practical, political and scientific obstacles that couldn't be fixed with funding alone — another warning sign on top of the reports concluding earlier programs hadn't worked.

Yet when I explained what I'd found to 20 scientists and carbon credit researchers — including several who have spent much of their careers working to implement, improve or study forest offsets — they sometimes responded angrily.

They agreed with the underlying facts. But when I asked if this indicated REDD was failing, they objected. Vehemently.

Amy Duchelle, a senior scientist at the Center for International Forestry Research, co-edited a book published last year that said REDD "has not yet delivered the expected overall impact of reducing [greenhouse gas] emissions" and tropical deforestation hasn't slowed.

She repeated these facts in an interview, emphasizing that these initiatives had been [useful in other ways](#), helping countries improve their ability to monitor deforestation and understand its causes, and secure land rights for indigenous communities. [She even found](#) "moderately encouraging" scientific results out of some projects.

The hunger for these offsets is blinding us to the mounting pile of evidence that they haven't — and won't — deliver the climate benefit they promise.

When we spoke again after my trip to Acre, however, she became heated. She'd spent years in Brazil, she said. What did I know after one brief trip? "You're not quoting me," she said. "I don't like the direction of this story."

Searchinger, the Princeton researcher, said people trying to make REDD work know its limitations. He helped me understand the resistance when it is criticized by outsiders, half-joking: "So the question is, 'OK, smartass, what's your solution?'"

Several researchers and scientists told me that forest preservation offsets had not gotten a real chance to succeed — that we won't really know until the world implements programs on a large scale, with billions more in funding. "The truth is, REDD remains a great idea that's hardly been tried," said Frances Seymour, a distinguished senior fellow at the World Resources Institute.

That means staking the future on government-run programs like the one in Acre.

At a contentious, six-hour public hearing last fall, the California Air Resources Board considered whether to adopt the Tropical Forest Standard, which would open the door for California and other governments to link with Acre or similar programs.

Officials from Brazil testified in support of the standard while global human rights groups urged the opposite. Indigenous and environmental activists spoke for both sides, and two competing letters, each signed by more than 100 scientists and researchers, argued for and against the proposal.

Supporters summed up what I'd heard, that it will help solve an urgent deforestation problem with global implications. Critics questioned the science. The uncertainties of carbon accounting, which get magnified by large-scale programs, are so nebulous, scientists don't even know how much they don't know.

Stanley Young, a spokesman for the board, told me California's standard has built-in safeguards to avoid repeating mistakes. "We're as aware as you are of how it has not worked in the past," he said.

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A cow pasture in the Chico Mendes reserve, with intact rainforest in the background.

The standard requires programs to exceed protections in existing policies and to show a drastic reduction in deforestation. It requires that trees stay standing for 100 years. But its guidance on leakage is just four sentences long, and it doesn't make countries report degradation, [potentially leaving out](#) a huge chunk of the emissions.

Jason Gray, chief of the board's cap-and-trade program, said degradation is hard to measure, but the standard will incentivize better monitoring so countries can add the data later. "If we wait to have the perfect information," he said, it might be too late.


In April, six members of the European Parliament [urged](#) California to reject the Tropical Forest Standard, citing concerns about Brazil's shifting politics and noting that the European Union hasn't allowed forestry credits in its cap-and-trade program

“due to concerns about their environmental integrity.”

The standard is under review by a [climate change committee](#) within the California Legislature, which may give recommendations during this spring’s session. The Air Resources Board will decide whether to approve the standard this year. Any potential purchase of tropical offsets would require additional board action.

Barbara Haya, a University of California, Berkeley, research fellow who studies the carbon market, said we’re deluding ourselves if we think these forestry programs will be able to accurately quantify — and therefore, cancel out — the amount of pollution claimed in an offset, even under the new standard.

The best we can hope for is a program that helps the climate in some unmeasurable way, she said. “That’s what offsets are. And I think that’s the best of what offsets can be.”

 A soybean plantation along Highway BR-364.

Satellite Analysis Methodology

To estimate the amount of forest left in the protected areas in the Cambodia project, ProPublica asked Descartes Labs to look at the [official project documents](#) filed with Verra, the nonprofit that set the standards for the credits generated. Those documents list the size of each of the 13 protected sites and how much of each site was still forested. On average, as of 2008, they were 88% forested. The project developers used Landsat satellite data with 30 meter resolution to define forested areas “containing at least 10% canopy cover, a tree height of 5 m, and a minimal area of 0.5 ha, for at least 10 years before the project start date.”

Descartes Labs then used the Global PALSAR Forest map, created by the [Japan Aerospace Exploration Agency](#), to examine the extent of forest in these areas as of 2017 using the geographic boundaries available in the project documents. The PALSAR data, which is available at 25 meter resolution, defined forested areas as “the tree covered land with the area larger than 0.5 ha and canopy cover over 10%,” almost identical to the 2008 definition.

The resulting maps, from 2017, show 46% of the protected areas, on average, are still forested.